Alberta Energy Regulator

Directive 054

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Performance Presentations, Auditing, and Surveillance of In Situ Oil Sands Schemes

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<original signed by>

Jim Ellis

President and Chief Executive Officer

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1 Purpose

This directive supersedes AER *Interim Directive (ID) 2002-03: Performance Presentations for In Situ Oil Sands Schemes*. For all in situ oil sands schemes in the Athabasca, Cold Lake, and Peace River Oil Sands Areas, the directive specifies

- performance presentation content, frequency, and formatting requirements (section 3), and
- special information requests resulting from AER audits and ongoing surveillance (section 4).

Since the issuance of *ID 2002-03* there has been a steady increase in the number of operating in situ schemes and expansions to existing schemes. As a result, the volume of data and information related to facility and wellbore operations and reservoir performance continues to expand. This directive will ensure that there is consistent and relevant reporting on the progress of in situ schemes and that operators are aware of their obligations respecting performance presentations and requests for data and information resulting from AER audits and ongoing surveillance of schemes.

Commercial scheme data and information required by this directive will be made available to the public unless confidential status has been granted under section 15(2) of the *Oil Sands Conservation Rules*. Specific requests to keep certain data or information confidential must be part of the commercial scheme application and must be made under section 15(2). The AER believes that all relevant information from a commercial scheme should be in the public domain in order to accelerate the pace of resource-recovery improvements and maximize the recovery of the resource.

Experimental scheme data and information required by this directive will be kept confidential for the period stated in the experimental scheme approval.

1.1 AER Requirements

Following AER requirements is mandatory for the responsible duty holder, as specified in legislation (e.g., licensee, operator, company, applicant, approval holder, or permit holder).

Information on compliance and enforcement can be found on the AER website.

1.2 What's New in This Edition

In this edition of *Directive 054*, all references to *Directive 019: Compliance Assurance*, which has been rescinded, and related information have been removed.

2 Resource Management Reports

Previously, certain operators were required to file annual resource management reports in accordance with the regulator's *Decisions 2000-022*,[1] *2003-023*,[2] and *2005-122*.[3] The information

[1] *Decision 2000-022: Gulf Canada Resources Limited Request for the Shut-in of Associated Gas, Surmont Area.*
[2] *Decision 2003-023: Chard Area and Leismer Field, Athabasca Oil Sands Area, Applications for the Production and Shut-in of Gas.*
[3] *Decision 2005-122: Phase 3 Final Proceeding Under Bitumen Conservation Requirements in the Athabasca Wabiskaw-McMurray.*

required in those reports is now included in section 3.1 of this directive as content requirements for performance presentations, eliminating the requirement for separate resource management reports where the areas subject to the three decisions are covered by approved schemes. Resource management reports in accordance with the decisions are still required for those areas not covered by approved schemes.

3 Performance Presentations

3.1 Organization and Content

The annual performance presentations are mainly intended to discuss the interpretation and conclusions reached on the data and information acquired. The presentation should focus on examples to illustrate key issues and general interpretations and conclusions. The detailed tabulated and graphical data required must be placed in appendices to the presentation. The data and information presented and submitted to the AER should be current, cover the period since the last presentation, and be prepared with a technical audience in mind. The presenters should be ready to answer questions from professional engineers, geologists, and other technical staff. Calculated data must be accompanied by an explanation of the calculation method.

For logistical reasons, the AER may require two or more performance presentations for larger schemes. In such cases, the meetings will generally be split between surface and subsurface issues relating to the scheme, as outlined in sections 3.1.1 and 3.1.2.

3.1.1 Subsurface Issues Related to Resource Evaluation and Recovery

Requirements	Comments
1) Brief background of the scheme and description of the bitumen recovery process (e.g., steam-assisted gravity drainage [SAGD]), including a map of the scheme, with the existing development highlighted.	
2) Geology/geoscience:	A full geological overview must be included in each annual presentation.
a) original bitumen in place (OBIP) and average reservoir properties for the entire approval area,	All OBIP volumes presented must be the operator's latest interpretation and must include the calculation method.
a) OBIP and average reservoir properties for the operating portion of the scheme,	

Requirements	Comments
b) isopach map of net bitumen pay over the entire approval area using all available well and seismic data, with net pays posted on map and contours labelled,	Map postings are required for all non-confidential evaluation wells. Maps must be the operator's latest interpretation, incorporating the most recent drilling and seismic information.
b) structure maps of the top and base of bitumen pay, with picks posted on map, and	Maps must be created with sufficient definition to be expandable and legible.
c) representative composite well logs over the exploited interval, including i) the well location on the type log, ii) the natural gamma ray, density-neutron porosity, spontaneous potential, and resistivity,	The composite well logs must be from well(s) in the scheme area and provide sufficient representation of the geology across the scheme area.
iii) On the type log, • top of zone under exploitation, • zone tops for immediately adjacent zones above and below the exploited zone, and • gas, bitumen, and water intervals, shales, sands, and carbonate intervals,	Within the Athabasca Oil Sands Area if the zone under exploitation is within the Wabiskaw-McMurray deposit, the entire Wabiskaw-McMurray interval must be included on the type log.
d) cored wells and any special core analyses conducted,	Discuss the results and implications of the analyses on recovery.
e) petrographic analyses identifying minerals that may impact scheme recovery,	
f) for experimental schemes, a structural cross-section for each well or well pair,	
g) for commercial and primary schemes, a representative structural cross-section for scheme area,	

Requirements	Comments
h) surface and subsurface geomechanical data and analyses,	Discuss relevant geomechanical learnings/issues (e.g., causes and impact of reservoir dilation, reservoir fracture gradients, monitoring of microfracturing)
i) heave monuments or other surface monitoring programs,	Discuss results from ongoing monitoring and how those results are being applied to the scheme operation and design.
j) 3-D seismic lines location map, and	
k) reservoir fracture pressure and the criteria used for establishing the integrity of the cap rock under the range of operating pressures.	Discuss the basis for the interpreted fracture pressure and cap rock integrity and any new learnings since the last presentation.
3) Drilling and completions:	
a) well layout/location map, including any new wells,	Maps must be created with sufficient definition to be expandable and legible.
b) for experimental schemes, well completions and workovers, including wellbore schematics, and	
c) for commercial schemes, typical wellbore schematics for injection and production wells.	
4) Artificial lift:	
a) type of artificial lift used for each well, and	An overview of which wells in a scheme use a given type of artificial lift and example(s) illustrating the performance.
b) discussion of overall artificial lift performance (e.g., range of lift capacity, operating temperature, and pressure).	

Requirements	Comments
5) Instrumentation in wells:	
a) for experimental schemes, thermocouples, fibre optics, and piezometers installed in wells, including wellbore schematics,	
b) for commercial schemes, thermocouples, fibre optics, and piezometers installed in wells, including typical wellbore schematics,	
c) for all schemes, as an appendix to the presentation, the lateral and vertical position of thermocouples, fibre optics, and piezometers installed in observation wells relative to production and injection well trajectories, and	
d) for all schemes, as an appendix to the presentation:	
i) piezometer plots, including supporting data points in tabular form,	Tabular piezometer and temperature data must be submitted in XML format.
ii) temperature vs. depth plots, including supporting data points in tabular form,	Temperature data and profiles must be at monthly intervals for all observation wells.
iii) if temperature logs are taken, excerpts over oil sands interval,	
iv) results of logs identifying vapour above the interpreted steam zone (i.e., partial pressure effects of non-condensable gas),	

Requirements	Comments
v) monthly injection pressures for all injection wells, submitted in tabular format, and	Where available, heel pressure with gas blanket must be reported as a monthly average. For cyclic steam stimulation (CSS) this average must be based on days on injection. Wellhead injection pressures are acceptable only at schemes where downhole pressures are not being taken. The data must be submitted in XML format.
vi) other well test data and analyses	
6) 4-D seismic:	
a) seismic lines location map, and	
b) interpreted results from seismic surveys, including extent of steam chamber development	
7) Scheme performance:	In your review of the scheme performance, group the supporting technical information, such as well logs, temperature vs. depth plots, and production graphs, to support your analyses and conclusions.
a) scheme aggregate plots and discussion:	Plots must include bitumen, gas, water, and steam, producing well count, and steam-oil ratio or other critical parameters used to evaluate the recovery process.
i) brief description of methodology for predicting scheme performance,	
ii) entire historical production and injection, and	
iii) reasons for differences between actual production and approval capacity,	

Requirements	Comments
b) for SAGD, some examples of plots and data submitted under 5(d) and a discussion of performance issues related to steam chamber expansion, non-condensable gas movement ahead of the steam chamber, and steam chamber operating pressure—discuss any observed effects of partial pressure on the heat transfer process and on the use of temperature profiles to locate the steam chamber,	Temperature vs. depth data presented to highlight performance issues must include a gamma ray plot on the vertical scale to illustrate heterogeneities that may be barriers to the vertical rise of the steam chamber and must show temperature profiles at monthly intervals.
c) pad reserves and discussion:	Must provide OBIP assumptions and calculations.
i) table showing OBIP for each pad,	
ii) table showing recovery to date and ultimate recovery for each pad,	The AER may require OBIP and reserves other than on a pad basis for specific schemes, depending on the size and age of the scheme.
iii) a minimum of three examples to illustrate low, medium, and high recovery pads or patterns, and	This must include a selection of individual well or pad production performance plots and other key performance indicators (e.g., temperature vs. depth plots, 4-D seismic, Reservoir Saturation Tool (RST) logs). While the AER normally expects monthly data, some issues require higher levels of detail; therefore, the use of daily data in plots is acceptable to highlight specific issues.
iv) a 5-year outlook of expected pad abandonments.	

Requirements	Comments
d) *discussion of overall temperature, pressure, and quality of steam injected;*	*Discuss how the pressure, temperature, and steam quality at the wellhead compare to the approved design, and describe the impact of any of these differences on the bitumen recovery mechanism. Also discuss implications of steam transport distance.*
e) composition of other injected/produced fluids (e.g., solvent, air, non-condensable gas)—for steam processes, the volume percentage of the total injection that the solvent or other fluid represents;	Discuss the impact on recovery of the injected fluids.
f) summary of key learnings (reservoir and operational) that have an impact on the success of the scheme;	Examples of impacts are start-up strategy, geology, wellbore trajectories, well placement, sidetrack and liner/pad communication, thief zones, water influx, artificial lift, operating pressure, and temperature.
g) follow-up on any issues identified during application processing or in previous presentations; and	
h) as an appendix to the presentation, plots on a pad basis of steam injection, bitumen production, and water production rates, steam–oil ratio, and other injected/produced fluid rates.	
5) Future plans	
a) any changes in the overall scheme recovery strategy for the scheme from that described in the original application or amendments and their relation to the key learnings above (e.g., plans to change well/pad placement, operating pressure, composition of injected fluid);	*Planned changes such as steal or vertical placement of wells, operating pressure, and injected fluid composition may impact conservation. If the AER considers the changes to be substantive, it will require an application to amend the scheme approval.*

Requirements	Comments
b) drilling plans for remainder of calendar year and next full year, and	
c) steam strategy plans for remainder of calendar year and next full year.	Discuss where steam will be injected, in what volumes, and the implications of steam shortages and suspensions of steam injection in other locations.

3.1.2 Surface Operations, Compliance, and Issues Not Related to Resource Evaluation and Recovery

Requirements	Comments
1) Facilities:	Clearly identify modifications since the last presentation.
a) detailed site survey plan, including modifications (plot plan),	For schemes with multiple plant sites, indicate connections between plants.
b) simplified plant schematic, including modifications,	
c) rationale for modifications identified in (a) and (b), and	
d) discussion of plant performance and whether it has met expectations.	
2) Discussion of measurement and reporting:	The method for estimating well production must include the typical well testing frequency and duration for prorating fractions, gas, and water production from the battery level to the well level.
a) methods used for estimating well production and injection volumes reported to Petrinex,	
b) water balance for the scheme and compliance with regulations on annual meter calibration, meter accuracy required, and meter locations,	
c) solvent injection and production measurement and reporting and how the solvent is distinguished from bitumen production, and	
d) non-condensable gas injection and production measurement and reporting.	

h. Measurement of fluid intake and freshwater intake sources and uses a. average on-off quantities (CWS) of fluid and freshwater intake on-ffs, and withdrawal locations for fluid intake taken from lakes, rivers, and ponds, and b. uses and volumes recorded for fluid intake make-up and freshwater intake make-up.	Identify the uses of fluid and freshwater make-up water in the volumes and for volumes required for each class the fuel presentations
i. Measurement of water in ground subfeedings and problems or necessary mass the fuel presentations	
k. Measurement of water and water disposal on/off-site of landfill water a. CWS of disposal on/off associated with the on/offsite, b. disposal volumes, processes, and temperatures, and c. locations of water disposal site and volumes associated with the volumes	
l. Additive production a. for operations with additive resources, i. comparisons of annual allowable quantities and additive resources to license conditions – supporting information must include monthly additive balance statements, ii. summary of additive resources and operations, including 1. monthly and iterations of fuel gas treatments and (e.g., Regen/Flare, BOOF) fuel gas events, 2. monthly, iterations, and type/fluxes (e.g., tonnes of	20 CRR 431 section 111, unless a specialized list records that operators must maintain. It does not differentiate the usage of additive resources and gas uses for maintenance.

eligible liquids of hydrogen fluoride, and

(c) if operations have not complied with approval conditions, cause said amounts received above to give rise exposure of concentrations.

(b) for operations with a eligible source conditions or "conviction, his or eligible sources;

(i) summary of priced periodic quotes over eligible processes;

(ii) sources of profit with a cap eligible processes;

(iii) monthly eligible balance for liquids; and

(iv) discounts of eligible emission levels — "date for eligible sources — affiliates;

(c) comparison of priced grab-sold, and selling a cap eligible blends 400 a emissions with conditions of Effective Environmental Protection and Enforcement for CFTC approvals; and

If the information is rejected for CFTC approval, a summary must be eligible to the NFA or withdrawal the proposed request of the facility operations

(d) summary of additional air quality monitoring results rejected under CFTC approval.

5. A summary of non-compliant cases;

Right to of summary only

(a) compliance cases related to regulatory approval (e.g., CFTC Regulation of Futures and Brokers).

B. accordance with the plan's applicable	
C. property and profit. Fund monitoring, property required under agent and creditor, ending a case, all quality, assets, loss of funds establishment.	Person request return of mail designated others.
D. after related to or as at, as at and after after or and one of its suspension, with other operation, stakeholders, or reported ending private, with	
E. property and profit of scheduled property, include (C) debtor or their for each standard for establishment, all discussed to survey 1.1 – your Trust's	
F. 1 electronic continuing creditors, 1.05 of conditions of the agent of with landlord, improvement. Standard, trust and risk, if not of the improvement Months, or as to completion, with	C assets, as, agent of with landlord, improvement, relating to assessment – ending hiring, step of the bankruptcy, case surviving, ability and as – attorney family charge, a Neighborhood, entitlement, and the replacement of this situation.
G. Of the creditors, does not a be a document of type the case of assumptions, and specific standards were for a warning, creditors.	Why is a attorney, 1 of the assumptions, and administrative, does the rate of Delaware event.
H. Point, about: A. keep such this and legal billion. B. are related to of divorce. C. report value that 1 of 3 years. Does application to the 1040, and D. as, charge to the, a will debt charge and in and vacation relating, to the please. Your have, described to will, unpaid application to spreadsheets, and file a notice to file for 1 warning, after a	Now, once a month, 1 agent, a attorney to to, a bill.

3.2 Frequency and Timing

The AER determines the schedule of performance presentations. Operators must submit performance presentations in electronic format to the In Situ Section of the AER Industry Operations Branch one week prior to the scheduled presentation date. Paper copies of the presentation are not required.

3.2.1 All Schemes

The first review for an approved scheme must be submitted one year following the issuance of the approval. In many cases this initial review will be prior to commencement of operations and will be an update on the drilling and resource evaluation and on any prospective changes to the original scheme design and approval conditions.

3.2.2 Commercial and Experimental Schemes

The AER requires annual performance presentations for all commercial and experimental recovery schemes, unless in the AER's judgment a more frequent performance review is necessary.

3.2.3 Primary Schemes

For primary recovery schemes, the AER requires triennial performance presentations (i.e., every three years), unless in the AER's judgment a more frequent performance review is necessary.

3.2.4 Exemption

The AER will consider a reduced frequency or exemption for schemes if

- implementation of an approved scheme has been delayed and no additional information is available,
- there are no remaining performance or compliance issues,
- there are no plans for operational changes or future expansion, or
- schemes have progressed to terminal phases.

3.3 Format

Performance presentations must conform to the following format requirements:

- All performance presentations must be submitted electronically as Adobe Acrobat PDF files that are full text searchable and expandable for legibility.
- Tabular data included in the appendices to the performance presentation must be submitted in XML format.
- Presentations must include a table of contents, and all slides and pages must be numbered.

- All units must be metric.
- All figures and graphs must be labelled and have brief descriptive text to explain the key messages intended.

4 Information Requests for Audits and Ongoing Surveillance

The AER may require operators to submit information and data in addition to the performance presentation requirements, as part of ongoing surveillance or as part of a facility audit conducted in accordance with *Directive 046: Production Audit Handbook*.